AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the above-identified application:

1. (currently amended) A fault detection system for detecting faults in a turbine engine, the fault detection system comprising:

a sensor data processor, the sensor data processor configured to receive ~~receiving~~ sensor data from the turbine engine and augment ~~augmenting~~ the sensor data to provide an augmented data set, wherein the sensor data processor is configured to augment ~~augments~~ the sensor data by generating residuals from the sensor data and determining a rate of change of the residuals; and

a fuzzy logic inference system, the fuzzy logic inference system configured to receive ~~receiving~~ the augmented data set, and wherein the fuzzy logic inference system includes a plurality of membership functions and wherein each of the plurality of membership functions is associated with at least one data type in the augmented data set, and wherein the fuzzy logic system is configured to fuzzify ~~fuzzifies~~ the augmented data set using the plurality of membership functions and analyze ~~analyzes~~ the augmented data set to determine a likelihood that a fault has occurred in the turbine engine.

2. (withdrawn-currently amended) The system of claim 1 wherein the sensor data processor is configured to augment ~~augments~~ the sensor data by determining a rate of change of the sensor data.

3. (cancelled).

4. (cancelled)

5. (currently amended) The system of claim 1 wherein the sensor data processor is configured to augment ~~augments~~ the sensor data by computing a margin for the sensor data.

6. (currently amended) The system of claim 1 ~~wherein the aircraft system comprises a turbine engine and~~ wherein the sensor data comprises engine speed data, fuel flow data and exhaust gas temperature data.

7. (currently amended) The system of claim 1 ~~wherein the aircraft system comprises a turbine engine and~~ wherein the sensor data processor is configured to receive ~~receives~~ exhaust gas temperature data and wherein the sensor data processor is configured to augment ~~augments~~ the exhaust gas temperature data by determining exhaust gas temperature margin data corresponding to a difference between the exhaust gas temperature data and a maximum safe temperature.

8. (cancelled)

9. (currently amended) The system of claim 1 wherein the fuzzy logic inference system includes a plurality of rules, and wherein the fuzzy logic system is configured to evaluate ~~evaluates~~ the fuzzified augmented data set according to the plurality of rules.

10. (currently amended) The system of claim 9 wherein the fuzzy logic inference system is further configured to aggregate ~~aggregates~~ outputs of the plurality of rules and defuzzify ~~defuzzifies~~ the aggregated output for input into a diagnostic system.

11. (currently amended) The system of claim 10 wherein the aircraft system comprises a turbine engine and wherein the sensor data comprises exhaust gas temperature data, engine speed data, and fuel flow data, and wherein the sensor data processor is configured to augment ~~augments~~ the sensor data by generating residuals from the exhaust gas temperature data, engine speed data, and fuel flow data, and wherein the sensor data processor is configured to further augment ~~augments~~ the sensor data by determining a rate of change of the residuals, and wherein the sensor data processor is configured to further augment ~~augments~~ the sensor data by determining a margin for the exhaust gas temperature data corresponding to a difference between the exhaust gas temperature data and a selected maximum safe exhaust gas temperature for the turbine engine.

12. (withdrawn) A method of detecting faults in a turbine engine, the method comprising the steps of:

a) receiving turbine sensor data from the turbine engine;

b) creating an augmented data set from the sensor data by determining residuals of the sensor data and determining the slope of the residuals;

c) fuzzifying the augmented data set by applying the membership functions to the augmented data set; and

d) applying a plurality of fuzzy logic rules to the fuzzy augmented data set to determine a likelihood of a fault in the turbine engine.

13. (cancelled)

14. (withdrawn) The method of claim 12 wherein the step of creating an augmented data set further comprises computing a margin for the sensor data.

15. (withdrawn) The method of claim 12 wherein the sensor data comprises engine speed data, fuel flow data and exhaust gas temperature data.

16. (withdrawn) The method of claim 12 wherein the sensor data includes exhaust gas temperature data and wherein the step of augmenting the sensor data comprises determining an exhaust gas temperature (EGT) margin from the exhaust gas temperature, the EGT margin corresponding to a difference between the exhaust gas temperature data and a maximum safe temperature.

17. (cancelled)

18. (withdrawn) The method of claim 12 wherein the step of applying the plurality of fuzzy logic rules to determine a likelihood of a fault in the turbine engine further comprises aggregating an output of the plurality of fuzzy logic rules.

19. (withdrawn) The method of claim 18 wherein the step of applying a plurality of fuzzy logic rules to determine a likelihood of a fault in the turbine engine further comprises defuzzifying the aggregated output for input into a diagnostic system.

20. (withdrawn-currently amended) The method of claim 12 wherein the sensor data comprises exhaust gas temperature data, engine speed data, and fuel flow data, and wherein the step of creating an augmented data set from the sensor data comprises generating residuals from the exhaust gas temperature data, engine speed data, and fuel flow data, and wherein the step of creating an augmented data set from the sensor data further comprises determining a rate of change of the residuals, and wherein the step of creating an augmented data set from the sensor data further comprises determining a margin for the exhaust gas temperature data corresponding to a difference between the exhaust gas temperature data and a selected maximum safe exhaust gas temperature.

21. (withdrawn-currently amended) A program product comprising:

a) a fault detection program, the fault detection program including:

a sensor data processor, the sensor data processor configured to receive ~~receiving~~ sensor data from a turbine engine and augment ~~augmenting~~ the sensor data to provide augmented data set, wherein the sensor data processor is configured to augment ~~augments~~ the sensor data by generating residuals from the sensor data and determining a rate of change of the residuals; and

a fuzzy logic inference system, the fuzzy logic inference system configured to receive ~~receiving~~ the augmented data set, and wherein the fuzzy logic inference system includes a plurality of membership functions and wherein each of the plurality of membership functions is associated with at least one data type in the augmented data set, and wherein the fuzzy logic system is configured to fuzzify ~~fuzzifies~~ the augmented data set using the plurality of membership functions and analyze ~~analyzes~~ the augmented data set to determine a likelihood that a fault has occurred in the turbine engine; and

b) computer-readable ~~signal-bearing~~ media bearing said fault detection program.

22. (cancelled) The program product of claim 21 wherein the computer-readable signal bearing media comprises recordable media.

23. (cancelled) The program product of claim 21 wherein the computer-readable signal bearing media comprises transmission media.

24. (cancelled)

25. (withdrawn) The program product of claim 21 wherein the sensor data comprises engine speed data, fuel flow data and exhaust gas temperature data

26. (withdrawn-currently amended) The program product of claim 21 wherein the sensor data processor is configured to receive ~~receives~~ exhaust gas temperature data and wherein the sensor data processor is configured to augment ~~augments~~ the exhaust gas temperature data by determining exhaust gas temperature margin data corresponding to a difference between the exhaust gas temperature data and a selected maximum safe exhaust gas temperature for the turbine engine.

27. (cancelled)

28. (withdrawn-currently amended) The program product of claim 21 wherein the fuzzy logic inference system includes a plurality of rules, and wherein the fuzzy logic system is configured to evaluate ~~evaluates~~ the fuzzified augmented data set according to the plurality of rules.

29. (withdrawn-currently amended) The program product of claim 28 wherein the fuzzy logic inference system is further configured to aggregate ~~aggregates~~ outputs of the plurality of rules and defuzzify ~~defuzzifies~~ the aggregated output for input into a diagnostic system.

30. (withdrawn-currently amended) The program product of claim 21 wherein the sensor data comprises exhaust gas temperature data, engine speed data, and fuel flow data, and wherein the sensor data processor is configured to augment ~~augments~~ the sensor data by generating residuals from the exhaust gas temperature data, engine speed data, and fuel flow data, and wherein the sensor data processor is configured to further augment ~~augments~~ the sensor data by determining a rate of change of the residuals, and wherein the sensor data processor is configured to further augment ~~augments~~ the sensor data by determining a margin for the exhaust gas temperature data corresponding to a difference between the exhaust gas temperature data and a selected maximum safe exhaust gas temperature for the turbine engine.

31. (currently amended) An apparatus comprising:

a) a computing processor;

b) a memory coupled to the processor;

c) a fault detection program residing in memory and being executed by the computing processor, the fault detection program including:

i) a sensor data processor, the sensor data processor configured to receive ~~receiving~~ sensor data from a turbine engine and augment ~~augmenting~~ the sensor data to provide augmented data set, wherein the sensor data processor is configured to augment ~~augments~~ the sensor data by generating residuals from the sensor data and determining a rate of change of the residuals; and

ii) a fuzzy logic inference system, the fuzzy logic inference system configured to receive ~~receiving~~ the augmented data set, and wherein the fuzzy logic inference system includes a plurality of membership functions and wherein each of the plurality of membership functions is associated with at least one data type in the augmented data set, and wherein the fuzzy logic system is configured to fuzzify ~~fuzzifies~~ the augmented data set using the plurality of membership functions and analyze ~~analyzes~~ the augmented data set to determine a likelihood that a fault has occurred.

32. (cancelled)

33. (original) The apparatus of claim 31 wherein the sensor data comprises engine speed data, fuel flow data and exhaust gas temperature data.

34. (currently amended) The apparatus of claim 31 wherein the sensor data processor is configured to receive ~~receives~~ exhaust gas temperature data and wherein the sensor data processor is configured to augment ~~augments~~ the exhaust gas temperature data by determining exhaust gas temperature margin data corresponding to a difference between the exhaust gas temperature data and a selected maximum safe exhaust gas temperature for the turbine engine.

35. (cancelled)

36. (currently amended) The apparatus of claim 31 wherein the fuzzy logic inference system includes a plurality of rules, and wherein the fuzzy logic system is configured to evaluate ~~evaluates~~ the fuzzified augmented data set according to the plurality of rules.

37. (currently amended) The apparatus of claim 36 wherein the fuzzy logic inference system is further configured to aggregate ~~aggregates~~ outputs of the plurality of rules and defuzzify ~~defuzzifies~~ the aggregated output for input into a diagnostic system.

38. (currently amended) The apparatus of claim 31 wherein the sensor data comprises exhaust gas temperature data, engine speed data, and fuel flow data, and wherein the sensor data processor is configured to augment ~~augments~~ the sensor data by generating residuals from the exhaust gas temperature data, engine speed data, and fuel flow data, and wherein the sensor data processor is configured to further augment ~~augments~~ the sensor data by determining a rate of change of the residuals, and wherein the sensor data processor is configured to further augment ~~augments~~ the sensor data by determining a margin for the exhaust gas temperature data corresponding to a difference between the exhaust gas temperature data and a selected maximum safe exhaust gas temperature for the turbine engine.